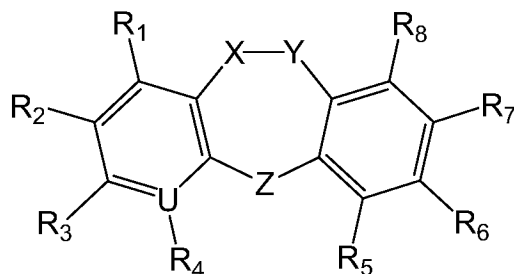


Amendments to the Claims

This listing of claims replaces all prior versions and listings of claims in the application.

Listing of Claims

1. (Currently Amended) A compound represented by formula (1),



Formula 1

wherein

when the X-Y bond is a single bond, X and Y are independently selected from the group consisting of:

CW₁W₂ wherein W₁ and W₂ are independently selected from the group consisting of one of a hydrogen atom, a halogen, a hydroxyl group, a lower alkyl group, a substituted lower alkyl group, a lower alkoxy group, a cycloalkyl group and a cycloalkenyl group,

C=O, and

C=NOW₃ wherein W₃ is a hydrogen atom or a lower alkyl group;

when the X-Y bond is a double bond, X and Y are each independently CW₄ wherein W₄ is any one of a hydrogen atom, a halogen, a hydroxyl group, a lower alkyl group, a substituted lower alkyl group, a lower alkoxy group or an acyloxy group;

Z is O;

U is C;

R₁ to R₄ are independently selected from the group consisting of a hydrogen atom, a lower alkyl group, a substituted lower alkyl group, a cycloalkyl group, a substituted cycloalkyl group, a lower alkenyl group, a substituted lower alkenyl group, a lower alkynyl group, a substituted lower alkynyl group, a halogen, a lower alkylcarbonyl group, a substituted lower alkylcarbonyl group, a trihalomethyl group, V₁W₅, a nitro group, an amino group, a substituted amino group, a cyano group, an acyl group, an acylamino group, a substituted acyl group, a substituted acylamino group, an aromatic ring, a substituted aromatic ring, a heterocycle and a substituted heterocycle wherein

V₁ is any one of O, S, S=O or SO₂.

W₅ is any one of a hydrogen atom, a lower alkyl group, a substituted lower alkyl group, a lower alkylcarbonyl group and a substituted lower alkylcarbonyl group, an acyloxy group or a trihalomethyl group, and

R₅ to R₈ are independently selected from the group consisting of a hydrogen atom, a lower alkyl group, a substituted lower alkyl group, a lower alkenyl group, a substituted lower alkenyl group, a lower alkynyl group, a substituted lower alkynyl group, a halogen, a lower alkylcarbonyl group, a substituted lower alkylcarbonyl group, a trihalomethyl group, V₂W₇, a nitro group, an amino group, a substituted amino group, an acylamino group, an aromatic ring, a substituted aromatic ring, a heterocycle and a substituted heterocycle; wherein

V₂ is one of O, S, S=O or SO₂,

W₇ is one of a hydrogen atom, a lower alkyl group, a substituted lower alkyl group, a lower alkylcarbonyl group, a substituted lower alkylcarbonyl group or a trihalomethyl group,

wherein:

W₀ is any one selected from the group consisting of a lower alkyl group and a substituted lower alkyl group,

when X is CHW₀, CW₀W₀ or CW₀ at least one of R₅ to R₈ is a hydroxyl group, provided that at least one of R₅, R₇ or R₈ is a hydroxy group when the X-Y bond is CH(C₂H₅)CO and R₆ is a hydroxyl group and

when X is other than CHW₀, CW₀W₀ or CW₀ at least one of R₅ to R₈ is a hydroxyl group and, at the same time, at least one of the other R₅ to R₈ is a group of OR wherein

~~W₀ is any one selected from the group consisting of a lower alkyl group and a substituted lower alkyl group and~~

R is any one selected from the group consisting of a hydrogen atom, a lower alkyl group, a substituted lower alkyl group, a lower alkylcarbonyl group and a substituted lower alkylsilyl group; and

when X-Y is CH₂CH₂, CHBrCH₂, CH₂CO, CHBrCO, CH=CH, CH=COCOCH₃ or CH=COCH₃,

at least one of R₁ to R₄ is an aromatic ring, a substituted aromatic ring, a heterocycle or a substituted heterocycle provided that when both R₆ and R₇ are hydroxyl groups, any one of R₁ to R₄ is not a phenyl group; or

at least one of R₁ to R₄ is SW₈ or S(O)W₉ wherein W₈ and W₉ independently are a lower alkyl group or a substituted lower alkyl group provided that R₇ is not a hydrogen atom when Z is O; or

R₂ is either a lower alkyl group or a substituted lower alkyl group and, at the same time, R₈ is a hydroxyl group provided that the number of carbon atoms of the lower alkyl group is 3 or more when Z is O; or

at least one of R₁ to R₄ is a lower alkylcarbonyl group provided that the number of carbon atoms of the lower alkyl group is 3 or more, a cycloalkylcarbonyl group or a cycloalkenylcarbonyl group and, at the same time, R₈ is a hydroxyl group; or

at least one of R₁ to R₄ is a cyano group; or

at least one of R₁ to R₄ is -C(=NOR)CH₃ wherein R is a hydrogen atom or a lower alkyl group, an optical isomer thereof, a conjugate thereof or a pharmaceutically acceptable salt thereof.

2. (Original) The compound according to claim 1, wherein R₆ is a hydroxyl group.
3. (Original) The compound according to claim 1, wherein R₆ and R₇ are hydroxyl groups.
4. (Original) The compound according to claim 1, wherein R₆ and R₈ are hydroxyl groups.
5. (Original) The compound according to claim 1, wherein R₅ and R₆ are hydroxyl groups.
6. (Previously Presented) The compound according to claim 1, wherein the X-Y bond is a single bond and X is CW₁W₂ or the X-Y bond is a double bond and X is CW, wherein at least one of W₁ and W₂ is selected from the group consisting of a lower alkyl group, a substituted lower alkyl group, a cycloalkyl group and a cycloalkenyl group and

W is one of a lower alkyl group, a substituted lower alkyl group, a cycloalkyl group or a cycloalkenyl group.

7. (Previously Presented) The compound according to claim 1, wherein Y is CO.

8. (Previously Presented) The compound according to claim 6, wherein the lower alkyl group is any one of a methyl group, an ethyl group, a *n*-propyl group, an isopropyl group, an *n*-butyl group, a *sec*-butyl group, an isobutyl group or a *tert*-butyl group.

9. (Previously Presented) The compound according to claim 1, wherein R₂ or R₃ is any one of a heterocycle, a substituted heterocycle, an aromatic ring or a substituted aromatic ring.

10. (Previously Presented) The compound according to claim 1, wherein the heterocycle is an aromatic heterocycle.

11. (Previously Presented) The compound according to claim 1, wherein R₂ or R₃ is SW₈ or S(O)W₉, wherein

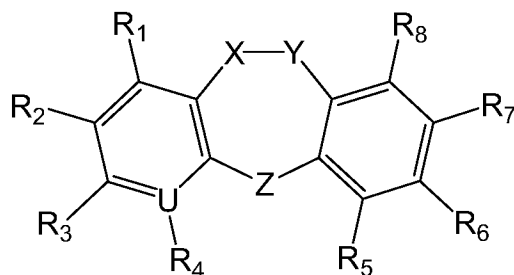
W₈ is a lower alkyl group or a substituted lower alkyl group, and

W₉ is a lower alkyl group or a substituted alkyl group.

12. (Previously Presented) The compound according to claim 11, wherein the lower alkyl group is any one of a methyl group, an ethyl group, a *n*-propyl group, an isopropyl group, an *n*-butyl group, a *sec*-butyl group, an isobutyl group or a *tert*-butyl group.

13-16. (Canceled)

17. (Currently Amended) A method of preparing a compound represented by formula (1),



Formula 1

wherein

when the X-Y bond is a single bond, X and Y are independently selected from the group consisting of:

CW₁W₂ wherein W₁ and W₂ are independently selected from the group consisting of one of a hydrogen atom, a halogen, a hydroxyl group, a lower alkyl group, a substituted lower alkyl group, a lower alkoxy group, a cycloalkyl group and a cycloalkenyl group,

C=O, and

C=NOW₃ wherein W₃ is a hydrogen atom or a lower alkyl group;

when the X-Y bond is a double bond, X and Y are each independently CW₄ wherein W₄ is any one of a hydrogen atom, a halogen, a hydroxyl group, a lower alkyl group, a substituted lower alkyl group, a lower alkoxy group or an acyloxy group;

Z is O;

U is C;

R₁ to R₄, are independently selected from the group consisting of a hydrogen atom, a lower alkyl group, a substituted lower alkyl group, a cycloalkyl group, a substituted cycloalkyl

group, a lower alkenyl group, a substituted lower alkenyl group, a lower alkynyl group, a substituted lower alkynyl group, a halogen, a lower alkylcarbonyl group, a substituted lower alkylcarbonyl group, a trihalomethyl group, V_1W_5 , a nitro group, an amino group, a substituted amino group, a cyano group, an acyl group, an acylamino group, a substituted acyl group, a substituted acylamino group, an aromatic ring, a substituted aromatic ring, a heterocycle and a substituted heterocycle wherein

V_1 is any one of O, S, S=O or SO_2 ,

W_5 is any one of a hydrogen atom, a lower alkyl group, a substituted lower alkyl group, a lower alkylcarbonyl group and a substituted lower alkylcarbonyl group, an acyloxy group or a trihalomethyl group, and

R_5 to R_8 are independently selected from the group consisting of a hydrogen atom, a lower alkyl group, a substituted lower alkyl group, a lower alkenyl group, a substituted lower alkenyl group, a lower alkynyl group, a substituted lower alkynyl group, a halogen, a lower alkylcarbonyl group, a substituted lower alkylcarbonyl group, a trihalomethyl group, V_2W_7 , a nitro group, an amino group, a substituted amino group, an acylamino group, an aromatic ring, a substituted aromatic ring, a heterocycle and a substituted heterocycle; wherein

V_2 is one of O, S, S=O or SO_2 ,

W_7 is one of a hydrogen atom, a lower alkyl group, a substituted lower alkyl group, a lower alkylcarbonyl group, a substituted lower alkylcarbonyl group or a trihalomethyl group,

wherein:

W_0 is any one selected from the group consisting of a lower alkyl group and a substituted lower alkyl group,

when X is CHW_0 , CW_0W_0 or CW_0 at least one of R_5 to R_8 is a hydroxyl group, provided that at least one of R_5 , R_7 or R_8 is a hydroxy group when the X-Y bond is $\text{CH}(\text{C}_2\text{H}_5)\text{CO}$ and R_6 is a hydroxyl group and

when X is other than CHW_0 , CW_0W_0 or CW_0 at least one of R_5 to R_8 is a hydroxyl group and, at the same time, at least one of the other R_5 to R_8 is a group of OR wherein

~~W_0 is any one selected from the group consisting of a lower alkyl group and a substituted lower alkyl group and~~

R is any one selected from the group consisting of a hydrogen atom, a lower alkyl group, a substituted lower alkyl group, a lower alkylcarbonyl group and a substituted lower alkylsilyl group; and

when X-Y is CH_2CH_2 , CHBrCH_2 , CH_2CO , CHBrCO , $\text{CH}=\text{CH}$, $\text{CH}=\text{COCOCH}_3$ or $\text{CH}=\text{COCH}_3$,

at least one of R_1 to R_4 is an aromatic ring, a substituted aromatic ring, a heterocycle or a substituted heterocycle provided that when both R_6 and R_7 are hydroxyl groups, any one of R_1 to R_4 is not a phenyl group; or

at least one of R_1 to R_4 is SW_8 or $\text{S}(\text{O})\text{W}_9$ wherein W_8 and W_9 independently are a lower alkyl group or a substituted lower alkyl group provided that R_7 is not a hydrogen atom when Z is O; or

R_2 is either a lower alkyl group or a substituted lower alkyl group and, at the same time, R_8 is a hydroxyl group provided that the number of carbon atoms of the lower alkyl group is 3 or more when Z is O; or

at least one of R_1 to R_4 is a lower alkylcarbonyl group provided that the number of carbon atoms of the lower alkyl group is 3 or more, a

cycloalkylcarbonyl group or a cycloalkenylcarbonyl group and, at the same time,

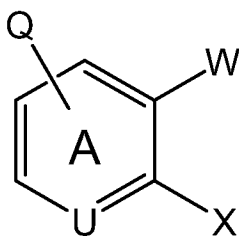
R₈ is a hydroxyl group; or

at least one of R₁ to R₄ is a cyano group; or

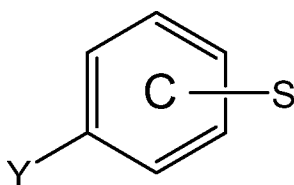
at least one of R₁ to R₄ is -C(=NOR)CH₃ wherein R is a hydrogen atom or a lower alkyl group, an optical isomer thereof, a conjugate thereof or a pharmaceutically acceptable salt thereof,

which comprises, in any order, the reaction steps of

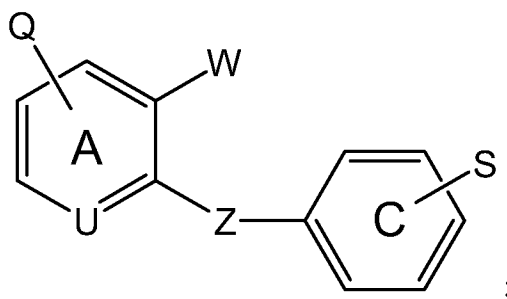
(1) bonding a ring A:



to a ring C:

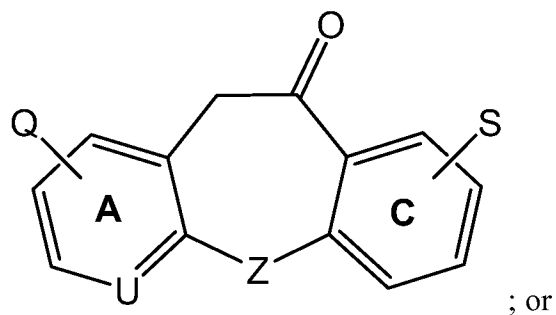


by the Ullman reaction to obtain a compound of the formula 1A:

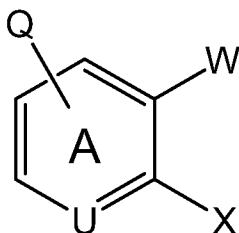


1A

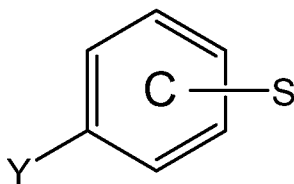
and then subjecting the formula 1A compound to a Friedel-Crafts reaction or a photoreaction to obtain a compound of formula:



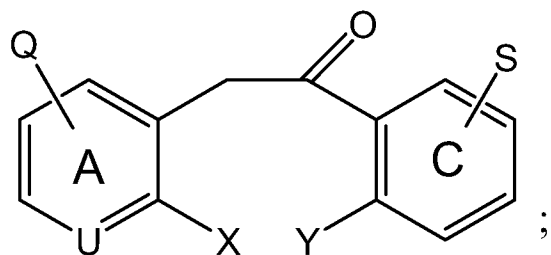
(2) bonding a ring A:



to a ring C:

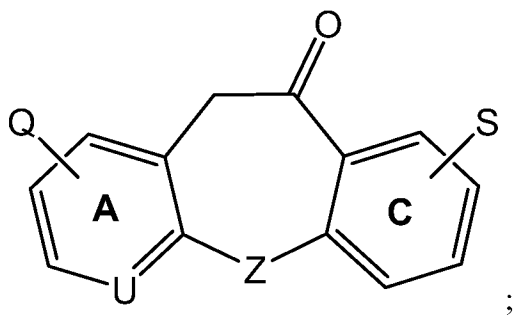


by the Friedel-Crafts reaction or photoreaction to obtain a compound of the formula 1B:



1B

and then subjecting the formula 1B compound to an Ullman reaction to obtain a compound of formula:



wherein:

each Q is independently selected from hydrogen atom, a lower alkyl group, a substituted lower alkyl group, a cycloalkyl group, a substituted cycloalkyl group, a lower alkenyl group, a substituted lower alkenyl group, a lower alkynyl group, a substituted lower alkynyl group, a halogen, a lower alkylcarbonyl group, a substituted lower alkylcarbonyl group, a trihalomethyl group, V_1W_5 , a nitro group, an amino group, a substituted amino group, a cyano group, an acyl group, an acylamino group, a substituted acyl group, a substituted acylamino group, an aromatic ring, a substituted aromatic ring, a heterocycle and a substituted heterocycle;

each S is independently selected from the group consisting of a hydrogen atom, a lower alkyl group, a substituted lower alkyl group, a lower alkenyl group, a substituted lower alkenyl

group, a lower alkynyl group, a substituted lower alkynyl group, a halogen, a lower alkylcarbonyl group, a substituted lower alkylcarbonyl group, a trihalomethyl group, V_2W_7 , a nitro group, an amino group, a substituted amino group, an acylamino group, an aromatic ring, a substituted aromatic ring, a heterocycle and a substituted heterocycle;

W is $-CH_2CO_2H$;

or W is a substituent that can be converted to $-CH_2CO_2H$ by a conversion reaction, a carbon atom increasing reaction, or by a reaction of deprotection;

U is C;

one of X and Y is a leaving group and the other is a nucleophilic group; and

Z is O.

18. (Previously Presented) The method according to claim 17 further comprising at least one of a carbon atom increasing reaction, a conversion reaction of a substituent, an introduction reaction of a substituent, a removal of the protection of a substituent, forming a salt, and performing optical resolution.

19. (Previously Presented) A pharmaceutical composition comprising an effective amount of the compound of claim 1 and a pharmaceutically acceptable carrier or diluent.

20. (Previously Presented) The pharmaceutical composition according to claim 19 wherein the pharmaceutical composition utilizes the tracheal smooth muscles relaxing action of the compound.

21. (Previously Presented) The pharmaceutical composition according to claim 19 wherein the pharmaceutical composition utilizes the inhibitory effect on airway hypersensitivity of the compound.

22. (Previously Presented) The pharmaceutical composition according to claim 19 wherein the pharmaceutical composition utilizes the inhibitory effect on inflammatory cells infiltration of the compound.

23. (Previously Presented) The pharmaceutical composition according to claim 19 wherein the pharmaceutical composition is used as the anti-asthmatic drug.

24 –25. (Canceled)

26. (Previously Presented) The compound of claim 1 wherein X and Y are the same.

27. (Previously Presented) The compound of claim 1 wherein X and Y are different.

28. (Previously Presented) The compound of claim 1 wherein W_1 and W_2 are the same.

29. (Previously Presented) The compound of claim 1 wherein W_1 and W_2 are different.

30. (Previously Presented) The compound of claim 1 wherein R_1 to R_4 are the same.

31. (Previously Presented) The compound of claim 1 wherein R_1 to R_4 are different.

32. (Previously Presented) The compound of claim 1 wherein R_5 to R_8 are the same.

33. (Previously Presented) The compound of claim 1 wherein R_5 to R_8 are different.

34. (Previously Presented) The compound according to claim 2, wherein the X-Y bond is a single bond and X is CW_1W_2 or the X-Y bond is a double bond and X is CW, wherein
at least one of W_1 and W_2 is selected from the group consisting of a lower alkyl group, a substituted lower alkyl group, a cycloalkyl group and a cycloalkenyl group and
W is one of a lower alkyl group, a substituted lower alkyl group, a cycloalkyl group or a cycloalkenyl group.

35. (Previously Presented) The compound according to claim 3, wherein the X-Y bond is a single bond and X is CW_1W_2 or the X-Y bond is a double bond and X is CW, wherein
at least one of W_1 and W_2 is selected from the group consisting of a lower alkyl group, a substituted lower alkyl group, a cycloalkyl group and a cycloalkenyl group and
W is one of a lower alkyl group, a substituted lower alkyl group, a cycloalkyl group or a cycloalkenyl group.

36. (Previously Presented) The compound according to claim 4, wherein the X-Y bond is a single bond and X is CW_1W_2 or the X-Y bond is a double bond and X is CW, wherein
at least one of W_1 and W_2 is selected from the group consisting of a lower alkyl group, a substituted lower alkyl group, a cycloalkyl group and a cycloalkenyl group and
W is one of a lower alkyl group, a substituted lower alkyl group, a cycloalkyl group or a cycloalkenyl group.

37. (Previously Presented) The compound according to claim 5, wherein the X-Y bond is a single bond and X is CW_1W_2 or the X-Y bond is a double bond and X is CW, wherein
at least one of W_1 and W_2 is selected from the group consisting of a lower alkyl group, a substituted lower alkyl group, a cycloalkyl group and a cycloalkenyl group and

W is one of a lower alkyl group, a substituted lower alkyl group, a cycloalkyl group or a cycloalkenyl group.

38. (Previously Presented) The compound according to claim 2, wherein Y is CO.

39. (Previously Presented) The compound according to claim 3, wherein Y is CO.

40. (Previously Presented) The compound according to claim 4, wherein Y is CO.

41. (Previously Presented) The compound according to claim 5, wherein Y is CO.

42. (Previously Presented) The compound according to claim 6, wherein Y is CO.

43. (Previously Presented) The compound according to claim 1, wherein the lower alkyl group is any one of a methyl group, an ethyl group, a *n*-propyl group, an isopropyl group, an *n*-butyl group, a *sec*-butyl group, an isobutyl group or a *tert*-butyl group.

44. (Previously Presented) The compound according to claim 2, wherein the lower alkyl group is any one of a methyl group, an ethyl group, a *n*-propyl group, an isopropyl group, an *n*-butyl group, a *sec*-butyl group, an isobutyl group or a *tert*-butyl group.

45. (Previously Presented) The compound according to claim 3, wherein the lower alkyl group is any one of a methyl group, an ethyl group, a *n*-propyl group, an isopropyl group, an *n*-butyl group, a *sec*-butyl group, an isobutyl group or a *tert*-butyl group.

46. (Previously Presented) The compound according to claim 4, wherein the lower alkyl group is any one of a methyl group, an ethyl group, a *n*-propyl group, an isopropyl group, an *n*-butyl group, a *sec*-butyl group, an isobutyl group or a *tert*-butyl group.

47. (Previously Presented) The compound according to claim 5, wherein the lower alkyl group is any one of a methyl group, an ethyl group, a *n*-propyl group, an isopropyl group, an *n*-butyl group, a *sec*-butyl group, an isobutyl group or a *tert*-butyl group.

48. (Previously Presented) The compound according to claim 6, wherein the lower alkyl group is any one of a methyl group, an ethyl group, a *n*-propyl group, an isopropyl group, an *n*-butyl group, a *sec*-butyl group, an isobutyl group or a *tert*-butyl group.

49. (Previously Presented) The compound according to claim 2, wherein R₂ or R₃ is any one of a heterocycle, a substituted heterocycle, an aromatic ring or a substituted aromatic ring.

50. (Previously Presented) The compound according to claim 3, wherein R₂ or R₃ is any one of a heterocycle, a substituted heterocycle, an aromatic ring or a substituted aromatic ring.

51. (Previously Presented) The compound according to claim 4, wherein R₂ or R₃ is any one of a heterocycle, a substituted heterocycle, an aromatic ring or a substituted aromatic ring.

52. (Previously Presented) The compound according to claim 5, wherein R₂ or R₃ is any one of a heterocycle, a substituted heterocycle, an aromatic ring or a substituted aromatic ring.

53. (Previously Presented) The compound according to claim 2, wherein R₂ or R₃ is SW₈ or S(O)W₉, wherein

W₈ is a lower alkyl group or a substituted lower alkyl group, and

W₉ is a lower alkyl group or a substituted alkyl group.

54. (Previously Presented) The compound according to claim 3, wherein R₂ or R₃ is SW₈ or S(O)W₉, wherein

W_8 is a lower alkyl group or a substituted lower alkyl group, and

W_9 is a lower alkyl group or a substituted alkyl group.

55. (Previously Presented) The compound according to claim 4, wherein R_2 or R_3 is SW_8 or $S(O)W_9$, wherein

W_8 is a lower alkyl group or a substituted lower alkyl group, and

W_9 is a lower alkyl group or a substituted alkyl group.

56. (Previously Presented) The compound according to claim 5, wherein R_2 or R_3 is SW_8 or $S(O)W_9$, wherein

W_8 is a lower alkyl group or a substituted lower alkyl group, and

W_9 is a lower alkyl group or a substituted alkyl group.

57. (Previously Presented) The compound according to claim 56, wherein the lower alkyl group is an one of a methyl group, an ethyl group, a *n*-propyl group, an isopropyl group, an *n*-butyl group, a *sec*-butyl group, an isobutyl group, or a *tert*-butyl group.

58. (Previously Presented) A pharmaceutical composition comprising an effective amount of the compound of claim 2 and a pharmaceutically acceptable carrier or diluent.

59. (Previously Presented) A pharmaceutical composition comprising an effective amount of the compound of claim 3 and a pharmaceutically acceptable carrier or diluent.

60. (Previously Presented) A pharmaceutical composition comprising an effective amount of the compound of claim 4 and a pharmaceutically acceptable carrier or diluent.

61. (Previously Presented) A pharmaceutical composition comprising an effective amount of the compound of claim 5 and a pharmaceutically acceptable carrier or diluent.

62. (Previously Presented) A pharmaceutical composition comprising an effective amount of the compound of claim 6 and a pharmaceutically acceptable carrier or diluent.

63. (Previously Presented) A pharmaceutical composition comprising an effective amount of the compound of claim 7 and a pharmaceutically acceptable carrier or diluent.

64. (Previously Presented) A pharmaceutical composition comprising an effective amount of the compound of claim 8 and a pharmaceutically acceptable carrier or diluent.

65. (Previously Presented) A pharmaceutical composition comprising an effective amount of the compound of claim 9 and a pharmaceutically acceptable carrier or diluent.

66. (Previously Presented) A pharmaceutical composition comprising an effective amount of the compound of claim 10 and a pharmaceutically acceptable carrier or diluent.

67. (Previously Presented) A pharmaceutical composition comprising an effective amount of the compound of claim 11 and a pharmaceutically acceptable carrier or diluent.

68. (Previously Presented) A pharmaceutical composition comprising an effective amount of the compound of claim 12 and a pharmaceutically acceptable carrier or diluent.